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10/28/03

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00MRA0546

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Melekian, et al.

Serial No.: 09/779,961

Examiner: McHenry Kevin L.

Filed: February 9, 2001

Group Art Unit: 1725

Title: METHOD FOR WELDING AN AXLE HOUSING

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Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

APPEAL BRIEF UNDER 37 C.F.R. § 1.192

Sir:

This is an Appeal Brief under 37 C.F.R. § 1.192 appealing the Final Rejection of the Primary Examiner dated April 18, 2003 (Paper No. 8). Each of the topics required by 37 C.F.R. § 1.192 is presented in this Brief and is labeled appropriately.

A check in the amount of \$330 is enclosed for the filing fee. If any additional fees or extensions are required, the Commissioner is authorized to charge Deposit Account No. 50-1482, in the name of Carlson, Gaskey & Olds.

I. REAL PARTY IN INTEREST

Meritor Heavy Vehicle Technology LLC is the real party in interest of the present application. An assignment of all rights in the present application to Meritor Heavy Vehicle Technology LLC was executed by the inventor and recorded by the U.S. Patent and Trademark Office at Reel 011550, Frame 0910.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to the present application of which the Appellants are aware.

III. STATUS OF CLAIMS

Claims 1-10, which are presented in the Appendix, stand finally rejected. Accordingly, the Appellants hereby appeal the final rejection of claims 1-10.

IV. STATUS OF AMENDMENTS

In response to a Final Office Action dated April 18, 2003, Appellant filed a Request for Reconsideration dated June 18, 2003 cancelling claims 11-20. The Examiner entered the Request for Reconsideration in an Advisory Action dated July 7, 2003, but maintained the rejection of remaining pending claims 1-10.

V. SUMMARY OF INVENTION

The invention is generally directed to a method of welding a differential housing 10 and a snorkel 14 together. Rather than relying on an outside arc welding device, the inventive method generates heat from at least one of the surfaces 26, 30 to be welded at its interface. The surfaces are then pressed against each other to weld them together. Because heat is generated from at least one of the surfaces at their interface, this method of welding avoids having to position a heat source near the curved surface of the housing 10 (Figures 2, 3, 4 and 5).

In one embodiment, heat is generated by electric discharge between the surfaces 26, 30. The electric discharge is generated by creating an electric potential between the surfaces 26, 30 and moving the surfaces near each other, creating an arc between the surfaces 26, 30. The heat from the electric discharge melts the surfaces 26, 30 at their interface. The molten surfaces are then pressed together to bond them together (Figure 3; page 4, line 15 to page 5, line 8).

Alternatively, heat may be generated at the surfaces 26, 30 via friction. Rubbing the surfaces against each other in a translational or rotational manner creates heat to melt the surfaces

26, 30 at their interface, allowing them to be welded together when they are pressed against each other. (Figure 5; page 5, lines 9-21).

VI. REFERENCES OF RECORD

In the Final Rejection of April 18, 2003, the Examiner relied upon the following prior art references:

- (1) U.S. Patent No. 4,754,847 to Glaze et al. ("Glaze");
- (2) U.S. Patent No. 5,442,977 to Danjou et al. ("Danjou");
- (3) U.S. Patent No. 1,323,178 to Gale ("Gale");
- (4) U.S. Patent No. 2, 911, 526 to Cox ("Cox");
- (5) U.S. Patent No. 4,552,609 to Larsen ("Larsen");
- (6) U.S. Patent No. 6,095,402 to Brownell et al. ("Brownell");
- (7) U.S. Patent No. 6,106,233 to Walker et al. ("Walker");
- (8) U.S. Patent No. 6,237,834 to Mahoney et al. ("Mahoney");
- (9) U.S. Patent No. 4,221,138 to Stewart et al. ("Stewart");
- (10) Appellant's Admitted Prior Art ("Appellant's APA").

VII. ISSUES

The issues addressed in this Appeal are:

- (1) whether claims 1-3 and 9-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Gale;
- (2) whether claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Gale and further in view of Cox;
- (3) whether claims 1, 6 and 8-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Larsen;

- (4) whether claims 1, 6, 7 and 9-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Brownell, Walker, or Mahoney;
- (5) whether claims 1-3 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Gale;
- (6) whether claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Gale and further in view of Cox.
- (7) whether claims 1, 6, and 8 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Larsen;
- (8) whether claims 1-3 and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Gale;
- (9) whether claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Gale and further in view of Cox;
- (10) whether claims 1, 6, 8, and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Larsen;
- (11) whether claims 1, 6, 7 and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Brownell, walker or Mahoney;
- (12) whether claims 1 and 9-10 are patentable under 35 U.S.C. § 103(a) over Appellant's APA.

VIII. GROUPING OF CLAIMS

For purposes of this Appeal, the claims are grouped as follows:

- (1) Claim 1 stands or falls alone;
- (2) Claims 2 and 3 stand or fall together;
- (3) Claim 4 stands or falls alone;
- (4) Claim 5 stands or falls lone;

- (5) Claims 6, 7, and 8 stand or fall together;
- (6) Claim 9 stands or falls alone;
- (7) Claim 10 stands or falls alone.

IX. ARGUMENTS

- (1) Claims 1-3 and 9-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Gale.

With respect to independent claim 1, The Examiner admitted that Glaze does not teach how a differential housing surface and snorkel are fastened together, but asserted that Danjou teaches a structure where blanks are welded to a housing. The Examiner also admitted that Danjou does not teach a specific welding method, but asserted that Gale teaches a process of welding surfaces together. The Examiner then argued that it would have been obvious to modify the teachings of Glaze by those of Danjou and Gale, stating that "[o]ne would have been motivated to do so in order to provide a means of fastening the differential housing surface by using welding as a fastening means, as taught by Danjou et al." and that "[o]ne would have been motivated to use the welding method taught by Gale as a specific welding means for fastening the parts and also as a welding means for fastening parts of different cross section, as taught by Gale" (Final Office Action, p. 3). Appellant respectfully disagrees.

The Examiner is not permitted to make a bald assertion that the Gale welding method would have been obvious for joining together the structures shown in Glaze and Danjou without explaining where the teaching or suggestion of the combination is found in the prior art. "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." MPEP § 2143.01. The Examiner has not shown where the prior art provides a suggestion or motivation for the proposed combination. Further, "the proposed modification cannot change the principle of operation of a reference." MPEP § 2143.01. Attempting to incorporate the welding method of

Gale into the structures of Glaze and Danjou would completely change the operating principles of Gale.

More particularly, there is no motivation to combine Glaze and Danjou with Gale because Gale specifically requires the parts being welded together to have significantly different cross-sectional areas. Gale's entire premise is based on the fact that a small, thin gauge tube will have a much higher electrical resistance than a larger one. As electric current is applied to both tubes, the smaller tube will heat more rapidly than the large tube, with the highest resistance occurring at the end of the smaller tube. The material of the smaller tube will therefore melt or burn away, allowing it to weld to the larger tube when the two tubes are pressed together (page 2, lines 9-68). Without a large cross-sectional area difference between the two parts being welded together, the method taught in Gage would be impossible because the resistance difference will not be high enough to simultaneously melt the smaller tube and heat the larger tube to create a proper weld (page 2, lines 25-48).

Glaze and Danjou, however, both show components having roughly the same cross-sectional area. Therefore, one of ordinary skill in the art would not have even considered Gale's welding method as an acceptable method for connecting the components in Glaze or Danjou. The mere fact that Danjou mentions welding is not enough to suggest incorporating the particular welding method shown in Gale because Gale requires specific relationships between the components being welded to produce the weld, relationships that Glaze and Danjou do not show. One of ordinary skill in the art would have had to ignore the explicit teachings of Gale to make it applicable to the structures shown in Glaze and Danjou.

Because the Examiner has not shown any motivation to combine the references and because the proposed combination would change the operating principles taught in Gale, the Examiner has failed to establish a *prima facie* case of obviousness with respect to independent claim 1. The final rejection of claim 1 is therefore improper and should therefore be withdrawn.

Claims 2 and 3 depend on independent claim 1, and therefore the final rejection of claims 2 and 3 is improper for the reasons explained above. As explained previously, one of ordinary skill in the art would not have been led to create an electric potential between a differential

housing surface and a blank surface given the teachings of Glaze, Danjou and Gale because the surfaces would not have created the large cross sectional area differences required in the teachings of Gale. The final rejection of claims 2 and 3 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. Further, both Glaze and Danjou teach flat differential housing surfaces, while Gale does not even show a differential housing, nor does Gale teach a welding method applicable to the differential housing surface and other component surfaces shown in Glaze and Danjou. The final rejection of claim 9 is therefore improper and should be withdrawn.

Claim 10 depends on independent claim 1, and therefore the final rejection of claim 10 is improper for the reasons explained above. As previously noted, Gale does not teach a welding method that can be applied to join a differential housing surface and any other surface having a comparable cross-sectional area, such as a snorkel. The final rejection of claim 10 is therefore improper and should be withdrawn.

(2) Claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Gale and further in view of Cox.

In the Final Office Action, the Examiner admitted that the Glaze/Danjou/Gale combination fails to teach moving the surfaces to be welded apart and together until the surfaces are welded together, but asserted that Cox teaches such a process. Appellant respectfully disagrees.

Claim 4 depends on independent claim 1, and therefore the final rejection of claim 4 is improper for the reasons explained above. There is also no motivation to add Cox to the proposed combination because Cox and Gale contain conflicting teachings. Cox teaches moving rails with respect to each other to ensure uniform heating of the surfaces to be welded up to the welding temperature (see, e.g., col. 4, lines 1-8). Gale, on the other hand, specifically teaches avoiding a step of preheating the surfaces to a uniform welding temperature by intentionally

allowing the smaller tube to get hotter than the larger tube so that the larger tube is heated by the excess heat radiating from the smaller tube (page 2, lines 42-57; page 3, lines 72-80. The Examiner is not permitted to ignore these contradictory teachings without weighing the suggestive power of each reference and taking that into account in the proposed combination. MPEP § 2143.01. The final rejection of claim 4 is therefore improper and should be withdrawn.

Claim 5 depends on independent claim 1, and therefore the final rejection of claim 5 is improper for the reasons explained above. As noted above, there is no motivation to combine Gale and Cox with Glaze and Danjou because, in part, Gale and Cox contain contradictory teachings. Thus, the proposed combination fails to suggest repeating the steps of moving a differential housing surface and blank surface apart and together until they are welded together. The final rejection of claim 5 is therefore improper and should be withdrawn.

(3) Claims 1, 6 and 8-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Larsen.

With respect to independent claim 1, the Examiner argued that it would have been obvious to connect the components shown in Glaze and Danjou with the friction welding method shown in Larsen. Appellant respectfully notes, however, that the Examiner is not permitted to simply assert that one would have been motivated to use the welding process taught in Larsen to connect components shown in Glaze and Danjou by stating that such a combination provides "a welding method that is low in cost, is uniform, and allows welding of dissimilar materials, as Larsen teaches" (p. 5). Glaze does not even mention welding, as admitted by the Examiner, and Danjou only mentions welding in passing without raising any of the issues solved by Larsen.

In fact, Danjou teaches shrink-fitting axle tubes 5 into the flange portions 3a and 3b before welding them together (col. 3, line 66 to col. 4, line 3). As is known in the art, shrink fitting will create a firm, virtually immovable connection between the parts, making it impossible to move the parts relative to each other for friction welding. Thus, one of ordinary skill in the art would not have considered the method shown in Larsen an acceptable welding method to be used with Danjou or Glaze. To establish a *prima facie* case of obviousness, there must be a reasonable

expectation of success in the proposed combination. MPEP § 2143. Clearly, the shrink fit connection taught in Danjou would eliminate any reasonable expectation of success in incorporating the friction welding process shown in Larsen. Because there is no motivation to combine Glaze and Danjou with Larsen, the final rejection of claim 1 is improper and should be withdrawn.

Claims 6 and 8 depend on independent claim 1, and therefore the final rejection of claims 6 and 8 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the friction welding process of Larsen to the shrink fitted structure shown in Danjou. The final rejection of claims 6 and 8 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the friction welding process of Larsen to the shrink fitted structure in Danjou. Thus, nothing in the proposed combination suggests welding a curved differential housing to a blank surface. The final rejection of claim 9 is therefore improper and should be withdrawn.

Claim 10 depends on independent claim 1, and therefore the final rejection of claim 10 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the friction welding process of Larsen to the shrink fitted structure in Danjou. Thus, nothing in the proposed combination suggests welding a differential housing to a snorkel. The final rejection of claim 10 is therefore improper and should be withdrawn.

(4) Claims 1, 6, 7 and 9-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Brownell, Walker, or Mahoney.

With respect to independent claim 1, the Examiner argued that it would have been obvious to connect the components shown in Glaze and Danjou with the linear friction welding methods shown in Brownell, Walker and Mahoney. As noted above, however, the shrink fit

connection taught in Danjou would have led one of ordinary skill in the art away from considering the linear friction welding methods taught by Brownell, Walker and Mahoney.

Danjou teaches shrink-fitting axle tubes 5 into the flange portions 3a and 3b before welding them together (col. 3, line 66 to col. 4, line 3). As is known in the art, shrink fitting parts together will make it practically impossible to move the parts relative to each other. Brownell, Walker and Mahoney, by contrast, all require oscillation of parts relative to each other to create the necessary friction and heat to create the weld. Thus, one of ordinary skill in the art would not have considered Brownell, Walker, or Mahoney acceptable welding methods to be used with Danjou. To establish a *prima facie* case of obviousness, there must be a reasonable expectation of success in the proposed combination. MPEP § 2143. Clearly, the shrink fit connection taught in Danjou would eliminate any reasonable expectation of success in incorporating the linear friction welding process shown in Brownell, Walker or Mahoney. Because there is no motivation to combine Danjou with Brownell, Walker or Mahoney, the final rejection of claim 1 is improper and should be withdrawn.

Claims 6 and 7 depend on independent claim 1, and therefore the final rejection of claims 6 and 7 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to the shrink fitted components shown in Danjou because the shrink fitted components will not be able to oscillate with respect to each other as required by Brownell, Walker, or Mahoney. The final rejection of claims 6 and 7 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to the structures shown in Glaze and Danjou because the shrink fitted components in Danjou are not able to oscillate with respect to each other. Thus, nothing in the proposed combination suggests welding a curved differential housing to a blank surface in the claimed manner. The final rejection of claim 9 is therefore improper and should be withdrawn.

Claim 10 depends on independent claim 1, and therefore the final rejection of claim 10 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to structures in Glaze and Danjou because the shrink fitted components in Danjou are not able to oscillate with respect to each other. Thus, nothing in the proposed combination suggests welding a differential housing to a snorkel in the claimed manner. The final rejection of claim 10 is therefore improper and should be withdrawn.

(5) Claims 1-3 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Gale.

With respect to independent claim 1, the Examiner admitted that Stewart does not teach a specific welding method, but asserted that it would have been obvious to modify the teachings of Stewart by those of Gale because "[o]ne would have been motivated to use the welding method taught by Gale as a specific welding means for fastening the parts" (p. 8). Appellant respectfully disagrees.

There is no motivation to combine Stewart with Gale because, as explained above, Gale specifically requires the parts being welded together to have significantly different cross-sectional areas. The material of the smaller tube will therefore melt or burn away, allowing it to weld to the larger tube when the two tubes are pressed together (page 2, lines 9-68).

As can be seen in Figure 5 of Stewart, an upper wall portion 24 of a tube segment 20 and a channel shaped stamping 26 welded to the upper wall portion 24 have planar surface areas that are welded together. The planar structure of the stamping 26 makes Gale's welding method completely inappropriate because the melting or burning away of material required in Gale's method would likely compromise the structure of the stamping 26.

Appellant notes that Gale expects material to be burned away to reduce welding time (page 2, lines 62-68). While this material loss would be insignificant for tubes or other materials having significant expendable length, it would be unacceptable for sheet-like structures such as those shown in Stewart because the material loss caused by Gale's method has the potential to make the stamping 26 thin enough to lose structural soundness and defeat the purpose of the

stamping 26, which is to add stress resistance to the housing (col. 3, line 37-39). "If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, there is no suggestion or motivation to make the proposed modification." MPEP § 2143.01. Thus, one of ordinary skill in the art would not have even considered Gale in selecting a welding method for attaching the stamping 26 to the tube segment 20.

Because the Examiner has not shown any motivation to combine Stewart and Gale and because the proposed combination would change the operating principles taught in Stewart, the Examiner has failed to establish a prima facie case of obviousness with respect to independent claim 1. The final rejection of claim 1 is therefore improper and should therefore be withdrawn.

Claims 2 and 3 depend on independent claim 1, and therefore the final rejection of claims 2 and 3 is improper for the reasons explained above. As explained previously, one of ordinary skill in the art would not have seen any reason to create an electric potential between a differential housing surface and a blank surface given the teachings of Stewart and Gale because the welding method taught in Gale is inappropriate for the planar channel shaped stamping 26 and upper wall portion 24 shown in Stewart. The final rejection of claims 2 and 3 is therefore improper and should be withdrawn.

(6) Claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Gale and further in view of Cox.

Claim 4 depends on independent claim 1, and therefore the final rejection of claim 4 is improper for the reasons explained above. As explained above, there is no motivation to combine Stewart with Gale because the welding process taught in Gale is inappropriate for joining the planar structures shown in Stewart. Further, as previously noted, there is no motivation to put Cox and Gale in the same combination because Cox and Gale contain conflicting teachings. The final rejection of claim 4 is therefore improper and should be withdrawn.

Claim 5 depends on independent claim 1, and therefore the final rejection of claim 5 is improper for the reasons explained above. As explained above, there is no motivation to combine Stewart with Gale because the welding process taught in Gale is inappropriate for joining the

planar structures shown in Stewart. Further, as previously noted, there is no motivation to put Cox and Gale in the same combination because Cox and Gale contain conflicting teachings. Thus, the proposed combination fails to suggest repeating the steps of moving a differential housing surface and blank surface apart and together until they are welded together. The final rejection of claim 5 is therefore improper and should be withdrawn.

(7) Claims 1, 6, and 8 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Larsen.

With respect to independent claim 1, the Examiner admitted that Stewart does not teach a specific welding method, but asserted that "[o]ne would have been motivated to use the welding method taught by Larsen as a specific welding means for fastening the parts" (p. 10). Appellant respectfully disagrees.

The friction welding process taught in Larsen focuses on welding a rotatable element to a fixed element at a specific rotational position (col. 1, lines 5-8; col. 2, lines 14-25). One of ordinary skill in the art would not have even considered Larsen in determining an appropriate welding method in Stewart because the stamping 26 and the tube segment 20 are not rotatable with respect to each other, nor are they designed to be. Further, the position of the stamping 26 within the tube segment 20 makes it impossible to rotate either component in a manner that allows rotational friction welding to occur. Thus, there is no motivation to combine Stewart with Larsen. The final rejection of claim 1 is therefore improper and should be withdrawn.

Claims 6 and 8 depend on independent claim 1, and therefore the final rejection of claims 6 and 8 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the rotational friction welding process of Larsen to the structure shown in Stewart because it is impossible to rotate the stamping 26 with respect to the tube segment 20. The final rejection of claims 6 and 8 is therefore improper and should be withdrawn.

(8) Claims 1-3 and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Gale.

With respect to independent claim 1, the Examiner admitted that Danjou does not teach a specific welding method, but asserted that Gale teaches a process of welding surfaces together. The Examiner then argued that it would have been obvious to modify the teachings of Danjou by the teachings of Gale, stating that "[o]ne would have been motivated to use the welding method taught by Gale as a specific welding means for fastening the parts and also as a welding means for fastening parts of different cross section, as taught by Gale" (Final Office Action, p. 12). Appellant respectfully disagrees.

As argued above, the Examiner is not permitted to make a bald assertion that the Gale welding method would have been obvious for joining together the structures shown in Danjou without explaining where the teaching or suggestion of the combination is found in the prior art. "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." MPEP § 2143.01. The Examiner has not shown where the prior art provides a suggestion or motivation for the proposed combination.

As explained above, Gale requires a large cross-sectional area difference between the two parts being welded together. Without this difference, the method taught in Gage would be impossible because the resistance difference will not be high enough to melt the smaller tube and simultaneously generate enough residual heat to the larger tube to create a proper weld (page 2, lines 25-48). Danjou, however, shows components having roughly the same cross-sectional area. One of ordinary skill in the art would not have even considered Gale's welding method as an acceptable method for connecting the components in Glaze or Danjou. The mere fact that Danjou mentions welding is not enough to suggest incorporating the method shown in Gale because Gale requires specific relationships between the components being welded to produce the weld. One of ordinary skill in the art would have had to ignore the explicit teachings of Gale to make it applicable to the structures shown in Danjou.

Because the Examiner has not shown any motivation to combine the references and because the proposed combination would change the operating principles taught in Gale, the

Examiner has failed to establish a prima facie case of obviousness with respect to independent claim 1. The final rejection of claim 1 is therefore improper and should therefore be withdrawn.

Claim 2 depends on independent claim 1, and therefore the final rejection of claim 2 is improper for the reasons explained above. As explained previously, one of ordinary skill in the art would not have seen any reason to create an electric potential between a differential housing surface and a blank surface given the teachings of Danjou and Gale because the surfaces would not have created the large cross sectional area differences required in the teachings of Gale. The final rejection of claim 2 is therefore improper and should be withdrawn.

Claim 3 depends on independent claim 1, and therefore the final rejection of claim 3 is improper for the reasons explained above. As explained previously, one of ordinary skill in the art would not have seen any reason to create an electric potential between a differential housing surface and a blank surface and move them in proximity to each other given the teachings of Danjou and Gale because the surfaces would not have created the large cross sectional area differences required in the teachings of Gale. The final rejection of claim 3 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. Further, both Danjou teach flat differential housing surfaces, while Gale does not even show a differential housing, nor does Gale teach a welding method applicable to the differential housing surface and other component surfaces shown in Danjou. The final rejection of claim 9 is therefore improper and should be withdrawn.

(9) Claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Gale and further in view of Cox.

Claim 4 depends on independent claim 1, and therefore the final rejection of claim 4 is improper for the reasons explained above. As noted above, there is no motivation to combine Cox with Danjou and Gale because Cox and Gale contain conflicting teachings. Cox teaches moving rails with respect to each other to ensure uniform heating of the surfaces to be welded up to the welding temperature (see, e.g., col. 4, lines 1-8), while Gale specifically teaches avoiding a

step of preheating the surfaces to a uniform welding temperature by intentionally allowing the smaller tube to get hotter than the larger tube so that the larger tube is heated by the excess heat radiating from the smaller tube (page 2, lines 42-57; page 3, lines 72-80). The Examiner is not permitted to ignore these contradictory teachings without weighing the suggestive power of each reference and taking that into account in the proposed combination. MPEP § 2143.01. The final rejection of claim 4 is therefore improper and should be withdrawn.

Claim 5 depends on independent claim 1, and therefore the final rejection of claim 5 is improper for the reasons explained above. As noted above, there is no motivation to combine Cox with Gale and Danjou because, in part, Gale and Cox contain contradictory teachings. Thus, the proposed combination fails to suggest repeating the steps of moving a differential housing surface and blank surface apart and together until they are welded together. The final rejection of claim 5 is therefore improper and should be withdrawn.

(10) Claims 1, 6, 8, and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Larsen.

With respect to independent claim 1, the Examiner argued that it would have been obvious to connect the components shown in Danjou with the vibration welding method shown in Larsen. As noted above, however, the shrink fit connection taught in Danjou makes it impossible to incorporate the friction welding method shown in Larsen because the shrink fit connection immobilizes the joined components with respect to each other. Thus, one of ordinary skill in the art would not have considered Larsen an acceptable welding method to be used with Danjou. To establish a *prima facie* case of obviousness, there must be a reasonable expectation of success in the proposed combination. MPEP § 2143. Clearly, the shrink fit connection taught in Danjou would eliminate any reasonable expectation of success in incorporating the friction welding process shown in Larsen. Because there is no motivation to combine Danjou with Larsen, the final rejection of claim 1 is improper and should be withdrawn.

Claims 6 and 8 depend on independent claim 1, and therefore the final rejection of claims 6 and 8 is improper for the reasons explained above. As explained above, one of ordinary skill in

the art would not have applied the friction welding process of Larsen to the shrink fitted structure shown in Danjou. The final rejection of claims 6 and 8 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the friction welding process of Larsen to the shrink fitted structure in Danjou. Thus, nothing in the proposed combination suggests welding a curved differential housing to a blank surface. The final rejection of claim 9 is therefore improper and should be withdrawn.

(11) Claims 1, 6, 7 and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Brownell, Walker or Mahoney.

With respect to independent claim 1, the Examiner argued that it would have been obvious to connect the components shown in Danjou with the linear friction welding methods shown in Brownell, Walker and Mahoney. As noted above, however, the shrink fit connection taught in Danjou would have led one of ordinary skill in the art away from considering the linear friction welding methods taught by Brownell, Walker and Mahoney because shrink fitting will create a firm connection between the parts, making it virtually impossible to move the connected parts relative to each other.

Brownell, Walker and Mahoney all require oscillation of parts relative to each other to create the necessary friction and heat to weld the parts together. Thus, one of ordinary skill in the art would not have considered Brownell, Walker, or Mahoney acceptable welding methods to be used with Danjou. As explained above, the shrink fit connection taught in Danjou would eliminate any reasonable expectation of success in incorporating the linear friction welding process shown in Brownell, Walker or Mahoney as required by MPEP § 2143. Because there is no motivation to combine Danjou with Brownell, Walker or Mahoney, the final rejection of claim 1 is improper and should be withdrawn.

Claims 6 and 7 depend on independent claim 1, and therefore the final rejection of claims 6 and 7 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to the shrink fitted components shown in Danjou because the shrink fitted components will not be able to oscillate with respect to each other as required by Brownell, Walker, or Mahoney. The final rejection of claims 6 and 7 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to the structure in Danjou because the shrink fitted components in Danjou are not able to oscillate with respect to each other. Thus, nothing in the proposed combination suggests welding a curved differential housing to a blank surface. The final rejection of claim 9 is therefore improper and should be withdrawn.

(12) Claims 1 and 9-10 are patentable under 35 U.S.C. § 103(a) over Appellant's APA.

With respect to independent claim 1, the Examiner argued that "the heat created by the art would be sufficient to weld the surfaces together" (p. 16). However, the Appellant's APA does not teach "generating heat from at least one of these surfaces at their interface" as recited in claim 1. Although applying an arc to the parts being welded together may cause the heat to flow through portions of the parts, the heat is generated by the arc, not from at least one of the surfaces being welded together. Further, the heat is not generated at the interface of the surfaces; instead, in the case of arc welding, the heat is generated at the outer periphery of the surfaces to be joined together. The final rejection of claim 1 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, nothing in Appellant's APA suggests generating heat from at least one surface to be welded. Therefore, nothing in the Appellant's APA suggests welding a curved differential housing to a blank surface in the claimed manner. The final rejection of claim 9 is therefore improper and should be withdrawn.

Claim 10 depends on independent claim 1, and therefore the final rejection of claim 10 is improper for the reasons explained above. As explained above, nothing in Appellant's APA suggests generating heat from at least one surface to be welded. Thus, nothing in the proposed combination suggests welding a differential housing to a snorkel. The final rejection of claim 10 is therefore improper and should be withdrawn.

X. CONCLUSION

For the reasons explained above, the final rejection of claims 1-10 is improper and should be withdrawn.

Respectfully submitted,

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Dated: October 20, 2003

CERTIFICATE OF MAILING

I hereby certify that this appeal brief (in triplicate) is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to Mail Stop Appeal Brief, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 20th day of October, 2003.

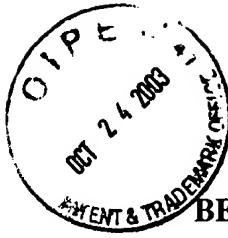

Beth A. Beard

XI. APPENDIX

Claims on appeal

1. A method of welding comprising the steps of:
providing a differential housing surface;
providing a blank surface;
generating heat from at least one of these surfaces at their interface sufficient to weld the surfaces together; and
applying the surfaces together.
2. The method of claim 1 wherein the heat is generated by electric discharge between the surfaces.
3. The method of claim 2 wherein the electric discharge results from creating an electric potential between the surfaces and moving the surfaces in proximity to each other to effect the electric discharge.
4. The method of claim 3 further including the step of moving the surfaces apart, creating another electric potential between the surfaces, moving the surfaces in proximity to each other to effect the electric discharge between the surfaces, and applying the surfaces together.
5. The method of claim 4 repeated until the surfaces are sufficiently welded together.
6. The method of claim 1 wherein the heat is generated by friction between the surfaces.
7. The method of claim 6 wherein the friction is created by moving one surface translationally relative to the other surface.

8. The method of claim 6 wherein the friction is created by moving one surface rotationally relative to the other surface.
9. The method of claim 1 wherein the differential housing surface is curved.
10. The method of claim 1 wherein the blank surface is a snorkel.



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Applicant: Melekian, et al.

Serial No.: 09/779,961

Examiner: McHenry Kevin L.

Filed: February 9, 2001

Group Art Unit: 1725

Title: METHOD FOR WELDING AN AXLE HOUSING

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Alexandria, VA 22313-1450

APPEAL BRIEF UNDER 37 C.F.R. § 1.192

Sir:

This is an Appeal Brief under 37 C.F.R. § 1.192 appealing the Final Rejection of the Primary Examiner dated April 18, 2003 (Paper No. 8). Each of the topics required by 37 C.F.R. § 1.192 is presented in this Brief and is labeled appropriately.

A check in the amount of \$330 is enclosed for the filing fee. If any additional fees or extensions are required, the Commissioner is authorized to charge Deposit Account No. 50-1482, in the name of Carlson, Gaskey & Olds.

I. REAL PARTY IN INTEREST

Meritor Heavy Vehicle Technology LLC is the real party in interest of the present application. An assignment of all rights in the present application to Meritor Heavy Vehicle Technology LLC was executed by the inventor and recorded by the U.S. Patent and Trademark Office at Reel 011550, Frame 0910.

II. RELATED APPEALS AND INTERFERENCES

There are no appeals or interferences related to the present application of which the Appellants are aware.

III. STATUS OF CLAIMS

Claims 1-10, which are presented in the Appendix, stand finally rejected. Accordingly, the Appellants hereby appeal the final rejection of claims 1-10.

IV. STATUS OF AMENDMENTS

In response to a Final Office Action dated April 18, 2003, Appellant filed a Request for Reconsideration dated June 18, 2003 cancelling claims 11-20. The Examiner entered the Request for Reconsideration in an Advisory Action dated July 7, 2003, but maintained the rejection of remaining pending claims 1-10.

V. SUMMARY OF INVENTION

The invention is generally directed to a method of welding a differential housing 10 and a snorkel 14 together. Rather than relying on an outside arc welding device, the inventive method generates heat from at least one of the surfaces 26, 30 to be welded at its interface. The surfaces are then pressed against each other to weld them together. Because heat is generated from at least one of the surfaces at their interface, this method of welding avoids having to position a heat source near the curved surface of the housing 10 (Figures 2, 3, 4 and 5).

In one embodiment, heat is generated by electric discharge between the surfaces 26, 30. The electric discharge is generated by creating an electric potential between the surfaces 26, 30 and moving the surfaces near each other, creating an arc between the surfaces 26, 30. The heat from the electric discharge melts the surfaces 26, 30 at their interface. The molten surfaces are then pressed together to bond them together (Figure 3; page 4, line 15 to page 5, line 8).

Alternatively, heat may be generated at the surfaces 26, 30 via friction. Rubbing the surfaces against each other in a translational or rotational manner creates heat to melt the surfaces

26, 30 at their interface, allowing them to be welded together when they are pressed against each other. (Figure 5; page 5, lines 9-21).

VI. REFERENCES OF RECORD

In the Final Rejection of April 18, 2003, the Examiner relied upon the following prior art references:

- (1) U.S. Patent No. 4,754,847 to Glaze et al. ("Glaze");
- (2) U.S. Patent No. 5,442,977 to Danjou et al. ("Danjou");
- (3) U.S. Patent No. 1,323,178 to Gale ("Gale");
- (4) U.S. Patent No. 2, 911, 526 to Cox ("Cox");
- (5) U.S. Patent No. 4,552,609 to Larsen ("Larsen");
- (6) U.S. Patent No. 6,095,402 to Brownell et al. ("Brownell");
- (7) U.S. Patent No. 6,106,233 to Walker et al. ("Walker");
- (8) U.S. Patent No. 6,237,834 to Mahoney et al. ("Mahoney");
- (9) U.S. Patent No. 4,221,138 to Stewart et al. ("Stewart");
- (10) Appellant's Admitted Prior Art ("Appellant's APA").

VII. ISSUES

The issues addressed in this Appeal are:

- (1) whether claims 1-3 and 9-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Gale;
- (2) whether claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Gale and further in view of Cox;
- (3) whether claims 1, 6 and 8-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Larsen;

(4) whether claims 1, 6, 7 and 9-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Brownell, Walker, or Mahoney;

(5) whether claims 1-3 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Gale;

(6) whether claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Gale and further in view of Cox.

(7) whether claims 1, 6, and 8 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Larsen;

(8) whether claims 1-3 and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Gale;

(9) whether claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Gale and further in view of Cox;

(10) whether claims 1, 6, 8, and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Larsen;

(11) whether claims 1, 6, 7 and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Brownell, walker or Mahoney;

(12) whether claims 1 and 9-10 are patentable under 35 U.S.C. § 103(a) over Appellant's APA.

VIII. GROUPING OF CLAIMS

For purposes of this Appeal, the claims are grouped as follows:

(1) Claim 1 stands or falls alone;

(2) Claims 2 and 3 stand or fall together;

(3) Claim 4 stands or falls alone;

(4) Claim 5 stands or falls lone;

- (5) Claims 6, 7, and 8 stand or fall together;
- (6) Claim 9 stands or falls alone;
- (7) Claim 10 stands or falls alone.

IX. ARGUMENTS

- (1) Claims 1-3 and 9-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Gale.

With respect to independent claim 1, The Examiner admitted that Glaze does not teach how a differential housing surface and snorkel are fastened together, but asserted that Danjou teaches a structure where blanks are welded to a housing. The Examiner also admitted that Danjou does not teach a specific welding method, but asserted that Gale teaches a process of welding surfaces together. The Examiner then argued that it would have been obvious to modify the teachings of Glaze by those of Danjou and Gale, stating that "[o]ne would have been motivated to do so in order to provide a means of fastening the differential housing surface by using welding as a fastening means, as taught by Danjou et al." and that "[o]ne would have been motivated to use the welding method taught by Gale as a specific welding means for fastening the parts and also as a welding means for fastening parts of different cross section, as taught by Gale" (Final Office Action, p. 3). Appellant respectfully disagrees.

The Examiner is not permitted to make a bald assertion that the Gale welding method would have been obvious for joining together the structures shown in Glaze and Danjou without explaining where the teaching or suggestion of the combination is found in the prior art. "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." MPEP § 2143.01. The Examiner has not shown where the prior art provides a suggestion or motivation for the proposed combination. Further, "the proposed modification cannot change the principle of operation of a reference." MPEP § 2143.01. Attempting to incorporate the welding method of

Gale into the structures of Glaze and Danjou would completely change the operating principles of Gale.

More particularly, there is no motivation to combine Glaze and Danjou with Gale because Gale specifically requires the parts being welded together to have significantly different cross-sectional areas. Gale's entire premise is based on the fact that a small, thin gauge tube will have a much higher electrical resistance than a larger one. As electric current is applied to both tubes, the smaller tube will heat more rapidly than the large tube, with the highest resistance occurring at the end of the smaller tube. The material of the smaller tube will therefore melt or burn away, allowing it to weld to the larger tube when the two tubes are pressed together (page 2, lines 9-68). Without a large cross-sectional area difference between the two parts being welded together, the method taught in Gage would be impossible because the resistance difference will not be high enough to simultaneously melt the smaller tube and heat the larger tube to create a proper weld (page 2, lines 25-48).

Glaze and Danjou, however, both show components having roughly the same cross-sectional area. Therefore, one of ordinary skill in the art would not have even considered Gale's welding method as an acceptable method for connecting the components in Glaze or Danjou. The mere fact that Danjou mentions welding is not enough to suggest incorporating the particular welding method shown in Gale because Gale requires specific relationships between the components being welded to produce the weld, relationships that Glaze and Danjou do not show. One of ordinary skill in the art would have had to ignore the explicit teachings of Gale to make it applicable to the structures shown in Glaze and Danjou.

Because the Examiner has not shown any motivation to combine the references and because the proposed combination would change the operating principles taught in Gale, the Examiner has failed to establish a *prima facie* case of obviousness with respect to independent claim 1. The final rejection of claim 1 is therefore improper and should therefore be withdrawn.

Claims 2 and 3 depend on independent claim 1, and therefore the final rejection of claims 2 and 3 is improper for the reasons explained above. As explained previously, one of ordinary skill in the art would not have been led to create an electric potential between a differential

housing surface and a blank surface given the teachings of Glaze, Danjou and Gale because the surfaces would not have created the large cross sectional area differences required in the teachings of Gale. The final rejection of claims 2 and 3 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. Further, both Glaze and Danjou teach flat differential housing surfaces, while Gale does not even show a differential housing, nor does Gale teach a welding method applicable to the differential housing surface and other component surfaces shown in Glaze and Danjou. The final rejection of claim 9 is therefore improper and should be withdrawn.

Claim 10 depends on independent claim 1, and therefore the final rejection of claim 10 is improper for the reasons explained above. As previously noted, Gale does not teach a welding method that can be applied to join a differential housing surface and any other surface having a comparable cross-sectional area, such as a snorkel. The final rejection of claim 10 is therefore improper and should be withdrawn.

(2) Claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Gale and further in view of Cox.

In the Final Office Action, the Examiner admitted that the Glaze/Danjou/Gale combination fails to teach moving the surfaces to be welded apart and together until the surfaces are welded together, but asserted that Cox teaches such a process. Appellant respectfully disagrees.

Claim 4 depends on independent claim 1, and therefore the final rejection of claim 4 is improper for the reasons explained above. There is also no motivation to add Cox to the proposed combination because Cox and Gale contain conflicting teachings. Cox teaches moving rails with respect to each other to ensure uniform heating of the surfaces to be welded up to the welding temperature (see, e.g., col. 4, lines 1-8). Gale, on the other hand, specifically teaches avoiding a step of preheating the surfaces to a uniform welding temperature by intentionally

allowing the smaller tube to get hotter than the larger tube so that the larger tube is heated by the excess heat radiating from the smaller tube (page 2, lines 42-57; page 3, lines 72-80. The Examiner is not permitted to ignore these contradictory teachings without weighing the suggestive power of each reference and taking that into account in the proposed combination. MPEP § 2143.01. The final rejection of claim 4 is therefore improper and should be withdrawn.

Claim 5 depends on independent claim 1, and therefore the final rejection of claim 5 is improper for the reasons explained above. As noted above, there is no motivation to combine Gale and Cox with Glaze and Danjou because, in part, Gale and Cox contain contradictory teachings. Thus, the proposed combination fails to suggest repeating the steps of moving a differential housing surface and blank surface apart and together until they are welded together. The final rejection of claim 5 is therefore improper and should be withdrawn.

(3) Claims 1, 6 and 8-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Larsen.

With respect to independent claim 1, the Examiner argued that it would have been obvious to connect the components shown in Glaze and Danjou with the friction welding method shown in Larsen. Appellant respectfully notes, however, that the Examiner is not permitted to simply assert that one would have been motivated to use the welding process taught in Larsen to connect components shown in Glaze and Danjou by stating that such a combination provides "a welding method that is low in cost, is uniform, and allows welding of dissimilar materials, as Larsen teaches" (p. 5). Glaze does not even mention welding, as admitted by the Examiner, and Danjou only mentions welding in passing without raising any of the issues solved by Larsen.

In fact, Danjou teaches shrink-fitting axle tubes 5 into the flange portions 3a and 3b before welding them together (col. 3, line 66 to col. 4, line 3). As is known in the art, shrink fitting will create a firm, virtually immovable connection between the parts, making it impossible to move the parts relative to each other for friction welding. Thus, one of ordinary skill in the art would not have considered the method shown in Larsen an acceptable welding method to be used with Danjou or Glaze. To establish a prima facie case of obviousness, there must be a reasonable

expectation of success in the proposed combination. MPEP § 2143. Clearly, the shrink fit connection taught in Danjou would eliminate any reasonable expectation of success in incorporating the friction welding process shown in Larsen. Because there is no motivation to combine Glaze and Danjou with Larsen, the final rejection of claim 1 is improper and should be withdrawn.

Claims 6 and 8 depend on independent claim 1, and therefore the final rejection of claims 6 and 8 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the friction welding process of Larsen to the shrink fitted structure shown in Danjou. The final rejection of claims 6 and 8 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the friction welding process of Larsen to the shrink fitted structure in Danjou. Thus, nothing in the proposed combination suggests welding a curved differential housing to a blank surface. The final rejection of claim 9 is therefore improper and should be withdrawn.

Claim 10 depends on independent claim 1, and therefore the final rejection of claim 10 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the friction welding process of Larsen to the shrink fitted structure in Danjou. Thus, nothing in the proposed combination suggests welding a differential housing to a snorkel. The final rejection of claim 10 is therefore improper and should be withdrawn.

(4) Claims 1, 6, 7 and 9-10 are patentable under 35 U.S.C. § 103(a) over Glaze in view of Danjou and Brownell, Walker, or Mahoney.

With respect to independent claim 1, the Examiner argued that it would have been obvious to connect the components shown in Glaze and Danjou with the linear friction welding methods shown in Brownell, Walker and Mahoney. As noted above, however, the shrink fit

connection taught in Danjou would have led one of ordinary skill in the art away from considering the linear friction welding methods taught by Brownell, Walker and Mahoney.

Danjou teaches shrink-fitting axle tubes 5 into the flange portions 3a and 3b before welding them together (col. 3, line 66 to col. 4, line 3). As is known in the art, shrink fitting parts together will make it practically impossible to move the parts relative to each other. Brownell, Walker and Mahoney, by contrast, all require oscillation of parts relative to each other to create the necessary friction and heat to create the weld. Thus, one of ordinary skill in the art would not have considered Brownell, Walker, or Mahoney acceptable welding methods to be used with Danjou. To establish a *prima facie* case of obviousness, there must be a reasonable expectation of success in the proposed combination. MPEP § 2143. Clearly, the shrink fit connection taught in Danjou would eliminate any reasonable expectation of success in incorporating the linear friction welding process shown in Brownell, Walker or Mahoney. Because there is no motivation to combine Danjou with Brownell, Walker or Mahoney, the final rejection of claim 1 is improper and should be withdrawn.

Claims 6 and 7 depend on independent claim 1, and therefore the final rejection of claims 6 and 7 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to the shrink fitted components shown in Danjou because the shrink fitted components will not be able to oscillate with respect to each other as required by Brownell, Walker, or Mahoney. The final rejection of claims 6 and 7 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to the structures shown in Glaze and Danjou because the shrink fitted components in Danjou are not able to oscillate with respect to each other. Thus, nothing in the proposed combination suggests welding a curved differential housing to a blank surface in the claimed manner. The final rejection of claim 9 is therefore improper and should be withdrawn.

Claim 10 depends on independent claim 1, and therefore the final rejection of claim 10 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to structures in Glaze and Danjou because the shrink fitted components in Danjou are not able to oscillate with respect to each other. Thus, nothing in the proposed combination suggests welding a differential housing to a snorkel in the claimed manner. The final rejection of claim 10 is therefore improper and should be withdrawn.

(5) Claims 1-3 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Gale.

With respect to independent claim 1, the Examiner admitted that Stewart does not teach a specific welding method, but asserted that it would have been obvious to modify the teachings of Stewart by those of Gale because "[o]ne would have been motivated to use the welding method taught by Gale as a specific welding means for fastening the parts" (p. 8). Appellant respectfully disagrees.

There is no motivation to combine Stewart with Gale because, as explained above, Gale specifically requires the parts being welded together to have significantly different cross-sectional areas. The material of the smaller tube will therefore melt or burn away, allowing it to weld to the larger tube when the two tubes are pressed together (page 2, lines 9-68).

As can be seen in Figure 5 of Stewart, an upper wall portion 24 of a tube segment 20 and a channel shaped stamping 26 welded to the upper wall portion 24 have planar surface areas that are welded together. The planar structure of the stamping 26 makes Gale's welding method completely inappropriate because the melting or burning away of material required in Gale's method would likely compromise the structure of the stamping 26.

Appellant notes that Gale expects material to be burned away to reduce welding time (page 2, lines 62-68). While this material loss would be insignificant for tubes or other materials having significant expendable length, it would be unacceptable for sheet-like structures such as those shown in Stewart because the material loss caused by Gale's method has the potential to make the stamping 26 thin enough to lose structural soundness and defeat the purpose of the

stamping 26, which is to add stress resistance to the housing (col. 3, line 37-39). "If the proposed modification would render the prior art invention being modified unsatisfactory for its intended purpose, there is no suggestion or motivation to make the proposed modification." MPEP § 2143.01. Thus, one of ordinary skill in the art would not have even considered Gale in selecting a welding method for attaching the stamping 26 to the tube segment 20.

Because the Examiner has not shown any motivation to combine Stewart and Gale and because the proposed combination would change the operating principles taught in Stewart, the Examiner has failed to establish a *prima facie* case of obviousness with respect to independent claim 1. The final rejection of claim 1 is therefore improper and should therefore be withdrawn.

Claims 2 and 3 depend on independent claim 1, and therefore the final rejection of claims 2 and 3 is improper for the reasons explained above. As explained previously, one of ordinary skill in the art would not have seen any reason to create an electric potential between a differential housing surface and a blank surface given the teachings of Stewart and Gale because the welding method taught in Gale is inappropriate for the planar channel shaped stamping 26 and upper wall portion 24 shown in Stewart. The final rejection of claims 2 and 3 is therefore improper and should be withdrawn.

(6) Claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Gale and further in view of Cox.

Claim 4 depends on independent claim 1, and therefore the final rejection of claim 4 is improper for the reasons explained above. As explained above, there is no motivation to combine Stewart with Gale because the welding process taught in Gale is inappropriate for joining the planar structures shown in Stewart. Further, as previously noted, there is no motivation to put Cox and Gale in the same combination because Cox and Gale contain conflicting teachings. The final rejection of claim 4 is therefore improper and should be withdrawn.

Claim 5 depends on independent claim 1, and therefore the final rejection of claim 5 is improper for the reasons explained above. As explained above, there is no motivation to combine Stewart with Gale because the welding process taught in Gale is inappropriate for joining the

planar structures shown in Stewart. Further, as previously noted, there is no motivation to put Cox and Gale in the same combination because Cox and Gale contain conflicting teachings. Thus, the proposed combination fails to suggest repeating the steps of moving a differential housing surface and blank surface apart and together until they are welded together. The final rejection of claim 5 is therefore improper and should be withdrawn.

(7) Claims 1, 6, and 8 are patentable under 35 U.S.C. § 103(a) over Stewart in view of Larsen.

With respect to independent claim 1, the Examiner admitted that Stewart does not teach a specific welding method, but asserted that "[o]ne would have been motivated to use the welding method taught by Larsen as a specific welding means for fastening the parts" (p. 10). Appellant respectfully disagrees.

The friction welding process taught in Larsen focuses on welding a rotatable element to a fixed element at a specific rotational position (col. 1, lines 5-8; col. 2, lines 14-25). One of ordinary skill in the art would not have even considered Larsen in determining an appropriate welding method in Stewart because the stamping 26 and the tube segment 20 are not rotatable with respect to each other, nor are they designed to be. Further, the position of the stamping 26 within the tube segment 20 makes it impossible to rotate either component in a manner that allows rotational friction welding to occur. Thus, there is no motivation to combine Stewart with Larsen. The final rejection of claim 1 is therefore improper and should be withdrawn.

Claims 6 and 8 depend on independent claim 1, and therefore the final rejection of claims 6 and 8 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the rotational friction welding process of Larsen to the structure shown in Stewart because it is impossible to rotate the stamping 26 with respect to the tube segment 20. The final rejection of claims 6 and 8 is therefore improper and should be withdrawn.

(8) Claims 1-3 and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Gale.

With respect to independent claim 1, the Examiner admitted that Danjou does not teach a specific welding method, but asserted that Gale teaches a process of welding surfaces together. The Examiner then argued that it would have been obvious to modify the teachings of Danjou by the teachings of Gale, stating that "[o]ne would have been motivated to use the welding method taught by Gale as a specific welding means for fastening the parts and also as a welding means for fastening parts of different cross section, as taught by Gale" (Final Office Action, p. 12). Appellant respectfully disagrees.

As argued above, the Examiner is not permitted to make a bald assertion that the Gale welding method would have been obvious for joining together the structures shown in Danjou without explaining where the teaching or suggestion of the combination is found in the prior art. "The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination." MPEP § 2143.01. The Examiner has not shown where the prior art provides a suggestion or motivation for the proposed combination.

As explained above, Gale requires a large cross-sectional area difference between the two parts being welded together. Without this difference, the method taught in Gage would be impossible because the resistance difference will not be high enough to melt the smaller tube and simultaneously generate enough residual heat to the larger tube to create a proper weld (page 2, lines 25-48). Danjou, however, shows components having roughly the same cross-sectional area. One of ordinary skill in the art would not have even considered Gale's welding method as an acceptable method for connecting the components in Glaze or Danjou. The mere fact that Danjou mentions welding is not enough to suggest incorporating the method shown in Gale because Gale requires specific relationships between the components being welded to produce the weld. One of ordinary skill in the art would have had to ignore the explicit teachings of Gale to make it applicable to the structures shown in Danjou.

Because the Examiner has not shown any motivation to combine the references and because the proposed combination would change the operating principles taught in Gale, the

Examiner has failed to establish a prima facie case of obviousness with respect to independent claim 1. The final rejection of claim 1 is therefore improper and should therefore be withdrawn.

Claim 2 depends on independent claim 1, and therefore the final rejection of claim 2 is improper for the reasons explained above. As explained previously, one of ordinary skill in the art would not have seen any reason to create an electric potential between a differential housing surface and a blank surface given the teachings of Danjou and Gale because the surfaces would not have created the large cross sectional area differences required in the teachings of Gale. The final rejection of claim 2 is therefore improper and should be withdrawn.

Claim 3 depends on independent claim 1, and therefore the final rejection of claim 3 is improper for the reasons explained above. As explained previously, one of ordinary skill in the art would not have seen any reason to create an electric potential between a differential housing surface and a blank surface and move them in proximity to each other given the teachings of Danjou and Gale because the surfaces would not have created the large cross sectional area differences required in the teachings of Gale. The final rejection of claim 3 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. Further, both Danjou teach flat differential housing surfaces, while Gale does not even show a differential housing, nor does Gale teach a welding method applicable to the differential housing surface and other component surfaces shown in Danjou. The final rejection of claim 9 is therefore improper and should be withdrawn.

(9) Claims 4 and 5 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Gale and further in view of Cox.

Claim 4 depends on independent claim 1, and therefore the final rejection of claim 4 is improper for the reasons explained above. As noted above, there is no motivation to combine Cox with Danjou and Gale because Cox and Gale contain conflicting teachings. Cox teaches moving rails with respect to each other to ensure uniform heating of the surfaces to be welded up to the welding temperature (see, e.g., col. 4, lines 1-8), while Gale specifically teaches avoiding a

step of preheating the surfaces to a uniform welding temperature by intentionally allowing the smaller tube to get hotter than the larger tube so that the larger tube is heated by the excess heat radiating from the smaller tube (page 2, lines 42-57; page 3, lines 72-80). The Examiner is not permitted to ignore these contradictory teachings without weighing the suggestive power of each reference and taking that into account in the proposed combination. MPEP § 2143.01. The final rejection of claim 4 is therefore improper and should be withdrawn.

Claim 5 depends on independent claim 1, and therefore the final rejection of claim 5 is improper for the reasons explained above. As noted above, there is no motivation to combine Cox with Gale and Danjou because, in part, Gale and Cox contain contradictory teachings. Thus, the proposed combination fails to suggest repeating the steps of moving a differential housing surface and blank surface apart and together until they are welded together. The final rejection of claim 5 is therefore improper and should be withdrawn.

(10) Claims 1, 6, 8, and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Larsen.

With respect to independent claim 1, the Examiner argued that it would have been obvious to connect the components shown in Danjou with the vibration welding method shown in Larsen. As noted above, however, the shrink fit connection taught in Danjou makes it impossible to incorporate the friction welding method shown in Larsen because the shrink fit connection immobilizes the joined components with respect to each other. Thus, one of ordinary skill in the art would not have considered Larsen an acceptable welding method to be used with Danjou. To establish a *prima facie* case of obviousness, there must be a reasonable expectation of success in the proposed combination. MPEP § 2143. Clearly, the shrink fit connection taught in Danjou would eliminate any reasonable expectation of success in incorporating the friction welding process shown in Larsen. Because there is no motivation to combine Danjou with Larsen, the final rejection of claim 1 is improper and should be withdrawn.

Claims 6 and 8 depend on independent claim 1, and therefore the final rejection of claims 6 and 8 is improper for the reasons explained above. As explained above, one of ordinary skill in

the art would not have applied the friction welding process of Larsen to the shrink fitted structure shown in Danjou. The final rejection of claims 6 and 8 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the friction welding process of Larsen to the shrink fitted structure in Danjou. Thus, nothing in the proposed combination suggests welding a curved differential housing to a blank surface. The final rejection of claim 9 is therefore improper and should be withdrawn.

(11) Claims 1, 6, 7 and 9 are patentable under 35 U.S.C. § 103(a) over Danjou in view of Brownell, Walker or Mahoney.

With respect to independent claim 1, the Examiner argued that it would have been obvious to connect the components shown in Danjou with the linear friction welding methods shown in Brownell, Walker and Mahoney. As noted above, however, the shrink fit connection taught in Danjou would have led one of ordinary skill in the art away from considering the linear friction welding methods taught by Brownell, Walker and Mahoney because shrink fitting will create a firm connection between the parts, making it virtually impossible to move the connected parts relative to each other.

Brownell, Walker and Mahoney all require oscillation of parts relative to each other to create the necessary friction and heat to weld the parts together. Thus, one of ordinary skill in the art would not have considered Brownell, Walker, or Mahoney acceptable welding methods to be used with Danjou. As explained above, the shrink fit connection taught in Danjou would eliminate any reasonable expectation of success in incorporating the linear friction welding process shown in Brownell, Walker or Mahoney as required by MPEP § 2143. Because there is no motivation to combine Danjou with Brownell, Walker or Mahoney, the final rejection of claim 1 is improper and should be withdrawn.

Claims 6 and 7 depend on independent claim 1, and therefore the final rejection of claims 6 and 7 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to the shrink fitted components shown in Danjou because the shrink fitted components will not be able to oscillate with respect to each other as required by Brownell, Walker, or Mahoney. The final rejection of claims 6 and 7 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, one of ordinary skill in the art would not have applied the linear friction welding process of Brownell, Walker, or Mahoney to the structure in Danjou because the shrink fitted components in Danjou are not able to oscillate with respect to each other. Thus, nothing in the proposed combination suggests welding a curved differential housing to a blank surface. The final rejection of claim 9 is therefore improper and should be withdrawn.

(12) Claims 1 and 9-10 are patentable under 35 U.S.C. § 103(a) over Appellant's APA.

With respect to independent claim 1, the Examiner argued that "the heat created by the art would be sufficient to weld the surfaces together" (p. 16). However, the Appellant's APA does not teach "generating heat from at least one of these surfaces at their interface" as recited in claim 1. Although applying an arc to the parts being welded together may cause the heat to flow through portions of the parts, the heat is generated by the arc, not from at least one of the surfaces being welded together. Further, the heat is not generated at the interface of the surfaces; instead, in the case of arc welding, the heat is generated at the outer periphery of the surfaces to be joined together. The final rejection of claim 1 is therefore improper and should be withdrawn.

Claim 9 depends on independent claim 1, and therefore the final rejection of claim 9 is improper for the reasons explained above. As explained above, nothing in Appellant's APA suggests generating heat from at least one surface to be welded. Therefore, nothing in the Appellant's APA suggests welding a curved differential housing to a blank surface in the claimed manner. The final rejection of claim 9 is therefore improper and should be withdrawn.

Claim 10 depends on independent claim 1, and therefore the final rejection of claim 10 is improper for the reasons explained above. As explained above, nothing in Appellant's APA suggests generating heat from at least one surface to be welded. Thus, nothing in the proposed combination suggests welding a differential housing to a snorkel. The final rejection of claim 10 is therefore improper and should be withdrawn.

X. CONCLUSION

For the reasons explained above, the final rejection of claims 1-10 is improper and should be withdrawn.

Respectfully submitted,

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Dated: October 20, 2003

CERTIFICATE OF MAILING

I hereby certify that this appeal brief (in triplicate) is being deposited with the United States Postal Service as First Class Mail, postage prepaid, in an envelope addressed to Mail Stop Appeal Brief, Commissioner of Patents, P.O. Box 1450, Alexandria, VA 22313-1450, on this 20th day of October, 2003.


Beth A. Beard

XI. APPENDIX

Claims on appeal

1. A method of welding comprising the steps of:
providing a differential housing surface;
providing a blank surface;
generating heat from at least one of these surfaces at their interface sufficient to weld the surfaces together; and
applying the surfaces together.
2. The method of claim 1 wherein the heat is generated by electric discharge between the surfaces.
3. The method of claim 2 wherein the electric discharge results from creating an electric potential between the surfaces and moving the surfaces in proximity to each other to effect the electric discharge.
4. The method of claim 3 further including the step of moving the surfaces apart, creating another electric potential between the surfaces, moving the surfaces in proximity to each other to effect the electric discharge between the surfaces, and applying the surfaces together.
5. The method of claim 4 repeated until the surfaces are sufficiently welded together.
6. The method of claim 1 wherein the heat is generated by friction between the surfaces.
7. The method of claim 6 wherein the friction is created by moving one surface translationally relative to the other surface.

8. The method of claim 6 wherein the friction is created by moving one surface rotationally relative to the other surface.
9. The method of claim 1 wherein the differential housing surface is curved.
10. The method of claim 1 wherein the blank surface is a snorkel.